Anna Terekhova

ENTERPRISES ENERGY SUSTAINABILITY: ICT APPROACH

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KAJAANIN AMMATTIKORKEAKOULU
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THESIS
ABSTRACT

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Author(s) Anna Terekhova	
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Growing concern about the environment, specifically global warming and climate change, is putting pressure on businesses to reduce their emissions of carbon dioxide (CO_2) and other GHG. Energy efficiency is the most effective GHG reduction opportunity for the near future; therefore enterprises are forced by political, economic and other forces to control their energy consumption. Regulatory compliance, public pressure, growing energy costs appear to pressure businesses of all types.

The challenge creates a market opportunity for ICT providers to develop solutions that quantify emissions and energy consumption, and help enterprises to manage their businesses more sustainably. The market for such Enterprise Carbon and Energy Management (ECEM) solutions is characterized by complexity and immaturity. As a result, enterprises are only partially aware of the benefits of such IT solutions.

The purpose of the present study was to determine if business opportunities already exist for the ICT sector and if the market for ECEM software is not too immature for the introduction of the new offering by T-Systems International GmbH. The study also sought to figure out the possible drivers for companies to implement the ECEM software. The qualitative marketing research was conducted in order to precisely describe the market environment for the ECEM software. The research methods were the experts' interviews and the online survey for Chief Information Officers (CIO) of German medium size and large enterprises. The market immaturity and the low level of awareness among the CIOs were confirmed. The main driver for implementing the ECEM software was identified as the cost saving opportunity through the increase of the operational efficiency and the decrease of the company's energy costs. These results are consistent with previous studies of McKinsey and Forrester analysts showing that ICT providers have significant business opportunities in the enterprises' trend toward the sustainability management.

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PREFACE

The importance of sustainability actions grows slowly, while the possibility of climate change, pollution, natural disasters, grows faster. The population of our Planet only starts to understand that carbon pollution and energy consumption issues are relevant to everyone and every company. Nevertheless, there are some countries and large enterprises worldwide which are concerned about this, so does Germany with its legal environmental regulations and economic initiatives. Large ICT enterprises recognize the business opportunity in the climate protection initiatives. T-Systems International GmbH is introducing the new portfolio offering "Smart Energy 4 Enterprises" on the market; which can be an enabler for the companies' sustainable behavior. Meanwhile, the market for carbon management software worldwide is developing with the state of the art technology.

The amount of literature available on the sustainability, carbon management or energy efficiency topics and possible ICT contribution is limited. The basis for the marketing research on the ICT companies' business opportunities in the energy efficiency area is two studies from international business technology and market research companies Forrester Research Inc. and McKinsey.

In Forrester Research "Market Overview: The Advent of Enterprise and Carbon Energy Management Systems (ECEM)" dated November 2009, the main drivers of the companies for the ECEM implementation are described. The Forrester study is taken as the basis for the further research of the forces and reasons for the companies to make energy and environmental topics of strategic importance.

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THE SYMBOL GLOSSARY

AG (Aktiengesellschaft) - public company

Carbon Footprint - a measure of the amount of carbon dioxide released into the atmosphere by a single endeavour or by a company, household, or individual through day-to-day activities over a given period.

CIO - Chief Information Officer

DIN Deutsches Institut für Normung eV - the German Institute for Standardization

ECEM (Enterprise Carbon and Energy Management Software) - a corporate wide systems of record for monitoring, managing and reporting energy use and carbon emissions.

EEEM - Enterprise Energy & Environmental Management System

EIA - Environmental Investigation Agency

GHG - Green House Gas, any of the gases whose absorption of solar radiation is responsible for the greenhouse effect, including carbon dioxide, methane, ozone, etc.

GmbH (Gesellschaft mit beschränkter Haftung) - limited liability company

IEA - International Energy Agency

MGI - The McKinsey Global Institute

OECD - Organization for Economic Co-operation and Development

PESTEL Analysis - Analysis of the external influences on a firm: the acronym stands for political, economic, social, technological, and environmental, legal.

Smart Meter - An electricity meter that can communicate remotely, bidirectionally and in near real time with an energy provider

SME - Small and Medium Enterprises

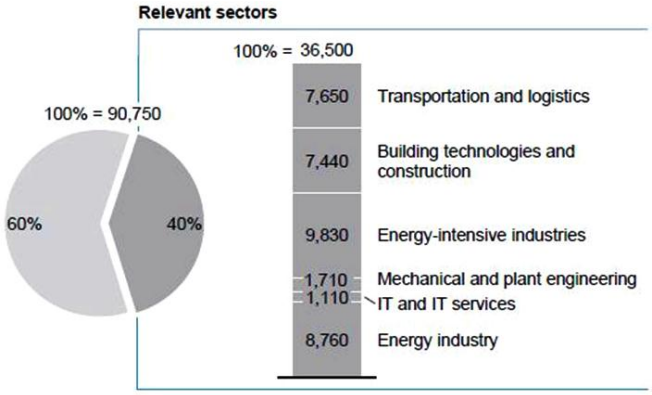
UNFCCC - United Nations Framework Convention on Climate Change

1 INTRODUCTION

For many years already scientists have stated the risk of climate change on our Planet. Human activities contribute to global change of climate by increasing the emission of gases responsible for the greenhouse effect. Carbon emissions are mostly associated with the climate change; therefore the world tries to tackle the problem of increasing CO_2 emissions. More than 80% of world's electricity production causes air pollution and emissions, as energy from renewable sources accounts for a still minor percentage. With the increase of the Earth's population, the demand for energy increases, as well as for other resources, that generates growing pollution.

Carbon management and energy efficiency are nowadays strategic issues to businesses, providing to them both risks and opportunities. Many companies understand the need to handle their emissions and electricity consumption, while carbon management and energy efficiency are moving up the corporate agenda. The soaring importance of those real matters for most companies is forced by multiple market drivers. What exactly does influence businesses to tackle the problem and make environmental sustainability the strategic priority? Business relevance of the energy efficiency topic brings opportunities for the businesses, which provide services towards the climate protection. The ICT sector can help other industries to develop more sustainable. The existence of the chances for the ICT sector in the energy efficiency area is undoubted. However, is it not too early to speak about business opportunities, when the companies cannot even commonly define the term sustainability?

Energy supports a wide variety of human activities and is a key driver of economic development. However, the energy sector contributes 80% of CO_2 emissions and 60% of total greenhouse gas (GHG) emissions annually, according to International Energy Agency (IEA). Man-made GHG emissions are largely to blame for global warming and climate instability. Therefore, a shift in patterns of productions, transmission and use of energy should be considered for an effective strategy to mitigate the climate change and avoid the increase in global temperatures. (IEA 2009 a, 3.) Consequently, energy efficiency strategies are essential not only for heavy emitters and high energy consuming companies, but for the other industries worldwide as well. In 2008 40% (EUR 36,500 billions) of the economic activity revenue worldwide was generated by the companies, for which energy resources and their costs are of strategic importance. McKinsey analysts predict the share to remain through to the year 2020. (McKinsey 2010, 12.) Table 1 shows those sectors and their revenues globally.



(Global revenues, 2008, EUR billions)

Figure 1: Energy Relevant Sectors in Global Economy (McKinsey 2010, 12)

The more detailed overview of the relevant sectors, where energy has a strategic importance is presented in the next table. Undoubtedly, those sectors are utilities, energy intensive industry, construction, engineering, and, remarkably, IT services and IT industry also belong to them.

Transport and Logistics	**7, 650**	4,040	Transportation services and logistics
		2, 070	Automotive engineering
		820	Rail, ship, and aircraft construction
		520	Mail and courier services
		200	Electronic vehicle components
Building Technologies and Construction	**7, 440**	5,600	Construction and building services
		560	Office electronics
		500	TV; radio, and telephones
		250	Heating technology and domestic appliances
		530	Other building technologies
Energy-intensive industries	**9,830**	3,880	Metals industry
		2,870	Chemicals
		1,570	Paper and pulp, plastics
		1, 510	Other
Mechanical and plant engineering	**1, 710**	1,380	Mechanical engineering
		330	Measurement and control systems, electronic components
IT and IT services	**1,110**	1,110	Software programming and associated services
Energy industry	**8,760**	5,390	Oil, coal and gas extraction, refineries
		2,340	Energy supplies
		1,030	Power station technologies

(Global revenues, 2008, EUR billions)

Figure 2: Energy Relevant Sectors Global Revenues in 2008 (McKinsey 2010, 13)

To better understand the drivers and the influences that force the companies to focus on energy efficiency and reducing carbon footprint, the factors are consolidated in a PESTEL analysis, which describes the influencing market environment. PESTEL analysis consists of influencing elements, which are divided to political, economic, social, technological, environmental, and legal sectors, depending on the kind of impact they have on the market.

In the further chapters each element of the PESTEL analysis will be expository represented, starting with the existing political influence on the energy efficiency area globally, in European Union and in Germany.

	National (Germany)	European Union	Global
Political	National Climate Protection Program	The Kyoto Protocol Carbon Disclosure Project International Energy Agency	
Economic	Partnership for Climate Protection, Energy Efficiency and Innovation Energy Management System Certification DIN EN 16001	EU Emissions Trading Scheme Green Stimulus Packages	Population Growth Energy Demand& Consumption Growth Energy Prices Increase
Social	Chief Sustainability Officer (CSO)		CDLI&CDPI
Technological	Energy Management Systems Software as a Service (SaaS) ICT sector		GeSI (Technology Cooperation)
Environmental	CO_2 Emissions Climate Change Forecasts Scarcity of Resources		
Legal	National Energy Efficiency Action Plan (NEEAP) The Eco-Taxes	EU Directive on Energy efficiency and services EU Action Plan on Energy Efficiency	

Figure 3: PESTEL Analysis of the macro-environment for energy efficiency

2.1 Political Factors

Political factors are how and to what degree a government intervenes in the economy. Specifically for energy efficiency area, political factors include environmental laws and political cooperation.

2.1.1 Global Political Factors

The strong global influences on international and European companies have the Kyoto Protocol, Carbon Disclosure Project and the activities of the International Energy Agency.

2.1.1.1 The Kyoto Protocol

The United Nations Framework Convention on Climate Change was opened for signature in 1992 in New York. It is non-binding international treaty that encourages countries to focus on reducing the GHG emissions worldwide to the level that would prevent the dangerous climate change. (UNFCCC 2009 a.) It is complemented by the legally binding agree-

ment, the Kyoto Protocol, adopted in 1997 in Japan. The Protocol, under which the industrialized countries committed themselves to reduction of GHG emissions, came into force in February 2005. Currently, 192 Parties, who have ratified the protocol, have to confront the issues of climate change and GHG emissions. Annex I countries, which are 39 industrialized countries and the European Union, are obliged to the collective GHG emissions' (six classes of gases: CO_2, CH_4, N_2O, HFCs, PFCs and SF_6) reduction of 5, 2 % from the 1990 level by the year 2012. (IPCC 2007, 113.) The total percentage of GHG emission of Annex I countries is around 63% (Task Force Central and Eastern Europe 2010). In addition, the Kyoto Protocol provides three mechanisms, how Annex I countries can achieve the required emissions reductions at lower costs through financial exchanges, projects in other countries. These flexible mechanisms are: the clean development mechanism, joint implementation and emissions trading. With the latter the term "carbon market" has appeared, meaning that the carbon, namely carbon emissions can be traced and traded between countries and industries nowadays. The countries that have spare emissions units can sell this excess capacity to other countries, which are over their emissions levels. (Kyoto Protocol 1998, Article 17.) Emission trading is also referred to as Cap and Trade System, which can be performed at national and organizational level as well (Environmental Business 2010). Under the Kyoto Protocol transparency of data is obligatory, i. e. monitoring and reporting of GHG emissions are required to confirm the compliance (Kyoto Protocol 1998, Article 7). The EU-15 states have committed themselves to the collective target of 8% reduction in GHG emissions for the period 2008-2012, particularly Germany established 21% reduction target (UNFCCC 2007, 22). Additionally, the table below shows the energy efficiency targets of some countries.

Region	Energy Efficiency Targets	Source/Additional Comments
China	2010 energy intensity 20% lower than 2006 levels. (Energy/ unit GDP)	China's 11th Five Year Plan. The energy intensity declined by 15.6% from 2006 to 2009 and a further reduction of 4.4% is required in 2010
Denmark	Save an average of 7.5 PJ (petajoules)annually during 2006-2013	Action plan for renewed energy-conservation
EU	2020 energy consumption 20% lower compared to the business as usual scenario. Member states to reach 9% energy savings over the period 2008 to 2016	Action Plan for Energy Efficiency: Currently, EU is drafting a new energy efficiency plan
France	Reduce energy intensity by 2% per year by 2015; 2.5% per year by 2030	France National Energy Efficiency Action Plan (NEEAP)
Germany	Double energy productivity by 2020 compared to 1990	Germany National Energy Efficiency Action Plan (NEEAP)
India	Save 5% of annual energy consumption by 2015	India's National Mission on Enhanced Energy Efficiency, dated 24th August 2009. This mission will enable about US$16bn worth of transactions in energy efficiency.
Korea	Improve energy source per unit by more than 45% from 2008 to 2030	Korea's National Basic Plan for Energy (2008-2030)
Russia	Reduce wasteful energy consumption by 40% by 2010	Financial Times article dated 4 August 2010.
Sweden	20% more efficient energy use by 2020	Sweden integrated climate and energy policy
UK	Targets to save energy by 9% over the period 2008 to 2016, but actual savings are expected to be 18%	UK Energy Efficiency Action Plan 2007.
US	Achieve all cost-effective energy efficiency by 2025	National Action Plan for Energy Efficiency Vision for 2025: A Framework for Change.

Figure 4: Summary of Energy Efficiency Targets (UBS 2010, 5)

2.1.1.2 Carbon Disclosure Project

The Carbon Disclosure Projects (CDP) organization, a non-profit organization, which was founded in Great Britain in 2000, focuses on the individual enterprises GHG emissions rather than on nations. Carbon Disclosure Projects is the only global climate change reporting system with already 3 000 organizations in 60 countries all over the world measuring and disclosing their greenhouse gas emissions and sustainability strategies. In 2009 the carbon performance score was introduced, which measured the companies' responses to CDP on the basis of the CDP scoring methodology. This rating methodology has been developed jointly by CDP and their global advisory PricewaterhouseCoopers (PwC). Companies with top scores after the disclosure of their information are listed on the Carbon Disclosure Leadership Index (CDLI); and the top companies for performance qualify to be listed on the Carbon Performance Leadership Index (CPLI) in their group, based on market capitalization. The both scores and indexes are based only on the companies' responses to CDP and are available for the public. (CDP 2009.) In 2010 CDP recognizes 48 from Global 500 enterprises in its CPLI. The CDP has asked the world's 500 largest public companies in the

FTSE Global Equity Index Series (Global 500) to demonstrate their actions towards the climate change issue. The response rate was 82% (410 companies), which is quite high in post-recession and policy uncertainty times. The results showed that the companies are tackling the problem of climate change i. e. they do try to control their emissions and energy consumption. 48% (187 companies) embedded climate change and carbon management into their business strategy. (PwC 2010.) In Table 4 the companies with the top scores in the year 2010 are presented.

Company	Carbon Disclosure Score	Carbon Performance Score	Sector
Siemens	98	A	Industrials
Deutsche Post	97	A	Industrials
BASF	96	A	Materials
Bayer	95	A	Health Care
Samsung Electronics	95	A	Information Technology
Lafarge	94	A	Materials
News Corporation	94	A	Consumer Discretionary
Philips Electronics	94	A	Industrials
National Australia Bank	93	A	Financials
Praxair	93	A	Materials
Reckitt Benckiser	93	A	Consumer Staples
Royal Bank of Scotland	93	A	Financials

Figure 5: Top companies recognized on both the CDLI and CPLI (PwC & CDP 2010)

The purpose of the CDP can be characterized as "The first step towards managing carbon emissions is to measure them, because in business what gets measured, gets managed" Lord Adair Turner, Chairman, UK Financial Services Authority (CDP 2009).

2.1.1.3 International Energy Agency

The International Energy Agency (IEA) was established in 1974 as an intergovernmental organization to coordinate policies and measures during the oil crisis of 1973-74 in the framework of the Organization for Economic Co-operation and Development (OECD). Nowadays with 220 energy experts and statisticians, IEA acts as the energy policy advisor to 28 member countries. It is recognized as one of the world's most authoritative sources for energy statistics. The current work of IEA focuses on energy security, economic development and environmental protection and on promotion of international collaboration on energy technology. (IEA 2010.)

The IEA has published policy recommendation to the G8 countries for promoting the energy efficiency issue and reducing the global CO_2 emissions by 8.2 gigatonnes by 2030. According to IEA, "energy efficiency offers a powerful and cost-effective tool for achieving a

sustainable energy future". (IEA 2009.) The IEA promotes energy efficiency policy and technology in buildings, appliances, transport and industry, as well as the end-use applications such as lightning. For the industry sector, which accounts for nearly one third of the total global primary energy supply and 36% of CO_2 emissions (IEA 2009 b, 33), the IEA suggested primary actions are: collection of high quality energy efficiency data, monitoring energy performance of companies, development of energy management systems and promotion of energy efficiency in enterprises (IEA 2007,11).

The IEA states that energy efficiency improvements, decarbonisation of the power sector through increasing use of renewable energy, nuclear power and CO_2 capture and storage (CCS), where fossil fuels are used, are the main components of the effective tackling the climate change problem by the energy sector (IEA 2009 a, 5).

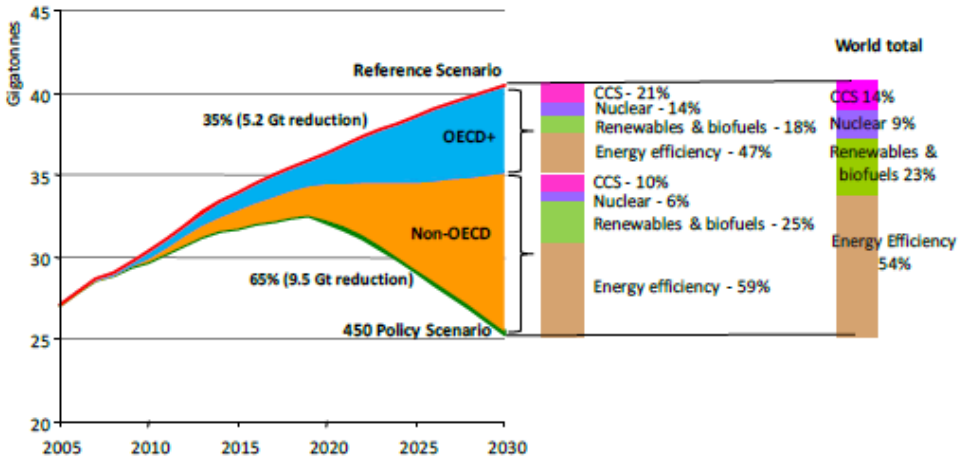


Figure 6: Possible Scenario of reduction of energy-related CO_2 emissions worldwide (IEA 2009 a, 4)

The 450 Policy Scenario of the IEA, which is shown in the figure 6, is based on the fact that energy efficiency initiatives in the countries would help to reduce the current CO_2 emission to 54% worldwide.

These measures and activities described below have political influence on the European Union as well. The factors that influence Germany are presented in the next chapter.

2.1.2 Political Factors Germany

Alongside to the National Climate Protection Programme, German government launches comprehensive series of promotion for renewable energy since 1990s and introduces new regulations, specifically for the energy efficiency in building and public transport sector.

2.1.2.1 National Climate Protection Programme

The objective of the German National Climate Protection Programme, which was introduced in 2005 by the German Federal Government of Climate Protection, is to ensure the achievement of the 21% target reduction of greenhouse gas emissions in Germany in the period 2008-2012. The Programme focuses on the industry sectors which are not covered by the EU Emissions Trading System. (Nationales Klimaschutzprogramm 2005, 4.) The targets for the 2008–2012 period are set by the Emissions Trading Allocations Act (ZuG 2007) and are thus legally binding (Nationales Klimaschutzprogramm 2005, 6). The targets are shown in the table below.

	Allocation Period 2005-2007	**Allocation Period 2008-2012**
Energy and Industry	503 mln t/year	495 mln t/year
Transport and Households	298 mln t/year	291 mln t/year
Trade, Commerce, Services	58 mln t/year	58 mln t/year
Total	859 mln t/year	844 mln t/year

Figure 7: German CO_2 emissions targets for different sectors (Nationales Klimaschutzprogramm 2005, 6)

The measures for achievement of these targets are regularly monitored by the Inter-Ministerial Working Group, which is obliged to submit an annual assessment report (Nationales Klimaschutzprogramm 2005, 5).

2.2 Economic Factors

Economic factors include the governmental regulations, which have economic effect on the companies, energy prices fluctuations, the influence of some demographic factors on the

need for larger investments in energy efficiency. These factors have major impacts on how businesses operate and make decisions.

2.2.1 Global Economic Factors

The growing global population raises the energy consumption, as the energy demand grows. Moreover, the population size affects energy indirectly, with involvement of other factors, like changes in economic development, approximated by income or gross domestic product (GDP) per capita. (Darmstadter 2004, 1.)

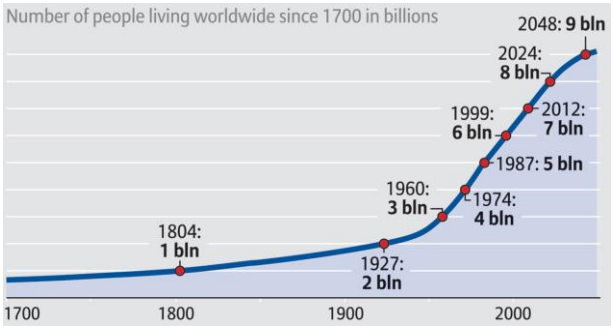


Figure 8: Global Population (Allianz 2009)

Consequently, with the greater per capita income increases the per capita consumption of energy. For example, "the average per capita GDP and energy consumption of the world's developing countries are, respectively, only about one-seventh and one-eighth those of industrial areas". (Darmstadter 2004, 1.) The future growing energy use is estimated by the energy agencies worldwide. Their forecasts are presented in the graph below.

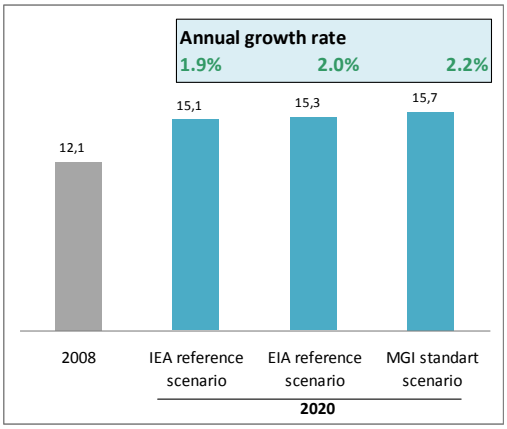


Figure 9: Global Energy Consumption Projection (McKinsey 2010, 10)

Furthermore, the boosted economic development is also linked with the urbanization, which concentrates population and economic activities in the cities, stimulating growth of the energy consumption (Forrester Research 2010, 5).

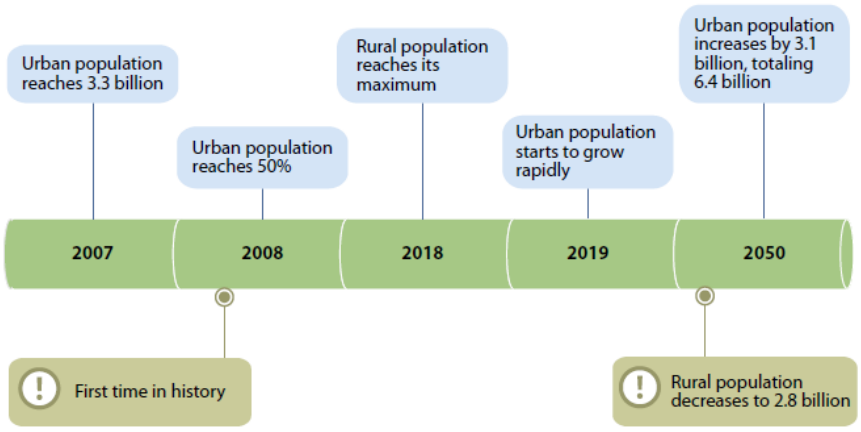


Figure 10: Rapid Urbanization Timeline (Forrester Research 2010, 5)

Further economic aspect, which is typically the burden on the companies, is the rising prices of fossil fuels. Oil prices are increasing at a faster rate than general price levels globally. In Germany, for instance, the annual rate for the oil price increase is 6, 3%. IEA forecasts the further price rise of fossil fuels, associated mainly with the scarcity of the global oil resources. (McKinsey 2010, 10.)

2.2.2 European Union Economic Factors

2.2.2.1 Emissions Trading Scheme

Under the flexible mechanisms of the Kyoto Protocol, the EU Emissions Trading Scheme (ETS), the first international company level cap-and-trade system was launched in 2005. The European carbon market with new service sectors, as carbon finance, carbon trading carbon management, carbon auditing, appeared with a set price on each tonne of carbon emitted. (European Commission 2009, 5.) The companies receive emissions allowances from the government lower than they do actually emit. So the companies have the obligation either to reduce their emissions or purchase the "missing" allowance on the market. When enterprises trade their allowances that could fully offset their emissions reduction costs. Thus, the EU

ETS puts the cost of emissions onto the agenda of management boards and drives the investment in low-carbon technologies. (European Commission 2009, 10.)

2.2.2.2 Green Stimulus Packages

Governments try to push public and companies towards a greener economy through the recovery packages. The stimulus packages are public investments in green infrastructure, low-carbon energy production, smart electricity grids, energy related research and development, mainly with the objective of a long term sustainable development. As part of the Economic Recovery Plan in Europe, four billion euros are being spent on those issues. Combined stimulus measures aimed at sustainable energy in the EU are estimated at EUR 26 billion totally. (European Commission 2010, 7.)

2.2.3 Economic Factors Germany

In Germany green stimulus packages for companies do also exist and are expanding for different sectors, for example German Ministry of Environment and climate protection (BMU) runs environmental innovation programme, which supports the development of energy efficiency and environmentally friendly technologies (Förderdatenbank 2010). Other economical influences in Germany are energy initiatives and partnerships, which stimulate companies to invest in energy efficiency and environmental issues.

2.2.3.1 Partnership for Climate Protection, Energy Initiative and Innovation (Klimaschutz Partnerschaft)

The partnership is developed by the German Federal Ministry of Economics and Technology (BMWi), German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), and Association of German Chambers of Industry and Commerce (DIHK) in 2009. The main objective is to support the companies' energy efficiency and climate protection initiatives, to encourage the increase in investments in those fields and to educate the companies on energy efficiency. (BMU 2009.) The Federal Ministry of Economics and Technology and KfW Bankengruppe are providing funding to facilitate access to advice and consulting on energy efficiency as well as low-interest loans from the Special

Fund for Energy Efficiency in SMEs in amount of EUR 12 million for 7000 advice services in 2010. (IEA 2010.) The partnership aims to launch German industry's climate protection and energy efficiency coalition from the companies with best practice examples (Klimaschutz-Partnerschaft 2009). In Germany those companies could also receive a proof of their best practice in energy efficiency, by applying for the certification of energy management systems.

2.2.3.2 The Certification of Energy Management Systems

EN 16001 is the management system standard which can be adopted by organizations of different size and sectors. The German version DIN EN 16001 is made according to the European standards. (BMU 2010, 10.) It focuses on implementing the energy management systems in the company, i.e. following the existing energy policy and monitoring the energy consumption of the company. The company can obtain the certification DIN EN 16001 after passing the auditing procedure from the issuing certificate utility or advisory company. For receiving the certification, the company should have and follow the energy policy with set energy targets. For that, the energy monitoring systems should be established and some energy efficiency projects should be implemented. (TÜV Rheinland 2009.)

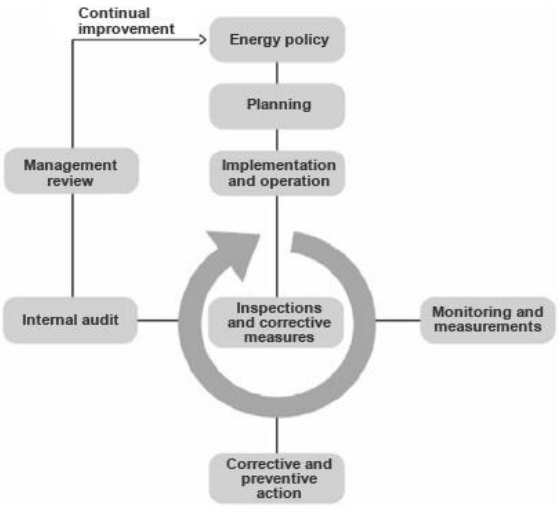


Figure 11: Implementimg Energy Management Systems (TÜV Rheinland 2009)

The certification is a valuable procedure to ascertain the best practice of energy management systems. For instance, in June 2009, around 1 900 sites from 1,400 organizations in Germany were registered for the EU Eco-Management and Audit Scheme (EMAS), which also

evaluates the environmental performance and the implementation of the energy management systems in the companies in Germany. (BMU 2010, 10.)

2.3 Global Social Factors

Nowadays the trend of having a chief sustainability officer (CSO), also called sustainability or environmental officer, or community vice president is spreading all over the world, especially within large enterprises. Surveys of the Corporate Social Responsibility worldwide find that about 20% of the world's largest companies have named a CSO or have a top executive dedicated to equivalent functions (Forrester Research 2009, 9). A CSO has an executive position within a company and is in charge of the corporation's environmental programmes, so that the companies can demonstrate their commitment to the environment. The work of the CSO is to improve its business through the use of sustainable business practices and also the representation of the company on the environmental and sustainability forums and panels. (The New York Times 03/2010.)

2.4 Global Technological Factors

Technological factors include technological aspects such as R&D activity, some technological changes; the technological advantages of the players on the energy efficiency market. Technological shifts can affect costs, quality, and lead to innovation.

2.4.1 Software as a Service (SaaS)

"Software as a Service, or SaaS, is the online delivery of software" (McKinsey 2008, 8). Instead of buying the software license and installing it on all employees computers, the companies have a possibility to use the applications needed on a pay for use basis hosted remotely by the external services providers (ESP) (McKinsey 2008, 8). Deployment of SaaS, the opposite of traditional on-premises applications, helps to save money, time and resources. SaaS is commonly defined as cloud services, and are often used for the enterprise resource planning (ERP) management systems applications (Gartner 2009, 5) and as well for the EEMS. The pay for use basis makes the services attractive for the companies and creates

the chance for carbon management software to be present in the companies IT systems. SaaS offerings are mostly implemented by the ICT (Information and Communication Technology) sector.

2.4.2 The Role of ICT sector

ICT sector worldwide was responsible for around 23 Mt CO_2 emissions in 2009 with about two percent of emissions in Germany with projection of growing to three percent by 2020 (SMART 2020 Addendum Deutschland 2009, 7). However, ICT sector through its solutions can save around 207 Mt CO_2 in 2020 that accounts for 25% of all Germany's carbon emissions, of which 13 Mt CO_2 in its own sector (SMART 2020 Addendum Deutschland 2009, 7). ICT solutions can contribute to significant emissions reductions in five areas: building management (Smart Buildings), logistics (Smart Logistics), power management (Smart Grid), industrial automation (Smart Engine), and dematerialization (SMART 2020 Addendum Deutschland 2009, 6). The latter meaning the use of virtual conferencing, E-documents, E-media, E-paper, and telecommuting (SMART 2020 Addendum Deutschland 2009, 57). The greatest CO_2 savings potential is in the logistic sector, up to 85 Mt CO_2 in 2020 through the intelligent control of traffic flow or the introduction of ICT-based urban tolls (SMART 2020 Addendum Deutschland 2009, 40). The other promising sector is the building industry, where up to 41, 8 Mt CO_2 could be saved through building environmental management systems (SMART 2020 Addendum Deutschland 2009, 34).

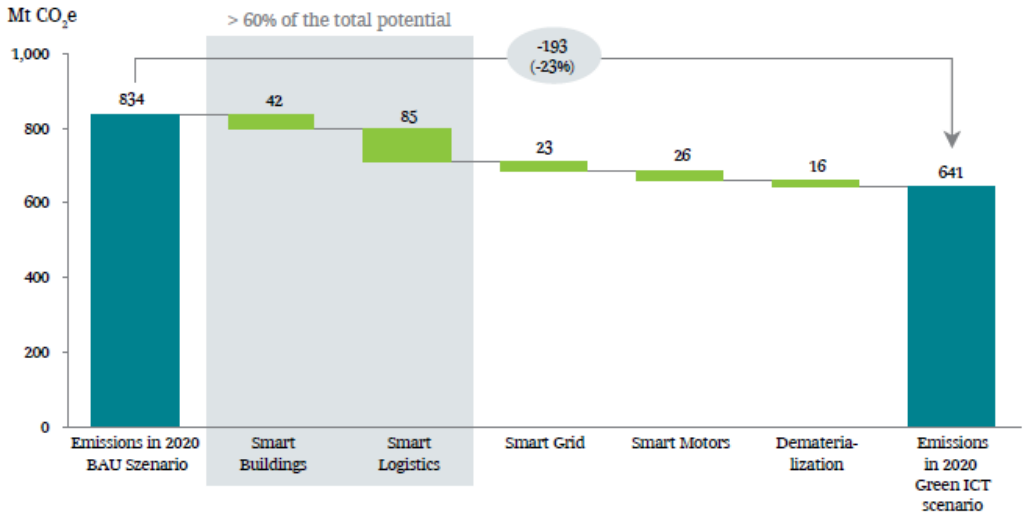


Figure 12: CO_2 reduction potential per sector through use of ICT solutions by 2020 (SMART 2020 Addendum Deutschland 2009, 28)

2.4.3 The Market for Carbon Management and Sustainability IT Solutions

Climate protection brings business opportunities for ICT companies, creating a market for particular ICT solutions. IT in energy management embodies ECEM, EEMS, the software solutions that create comprehensive transparency on energy consumption, comparing it with the historical data and target levels and help to run production and other processes in the company in a more energy efficient way (McKinsey 2010, 37). Energy management systems are based on Information Technologies, which make it possible in the company to increase energy efficiency and lower GHG emissions. The market size for such IT services grows 14% annually and will reach EUR 15 bn in 2020 (McKinsey 2010, 37). The graph below shows, that IT in energy management solutions has higher market potential than smart grids solutions or traffic management systems.

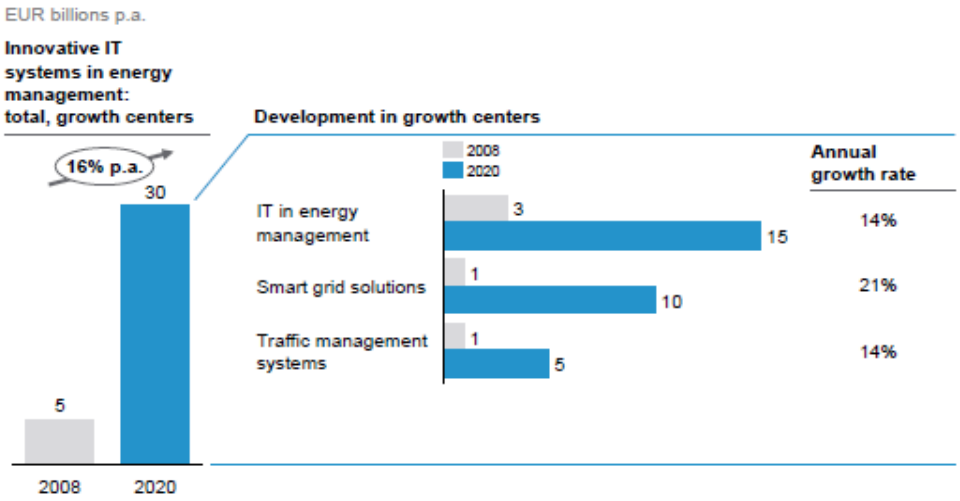


Figure 13: Innovative IT systems in energy management and their global market potential (McKinsey 2010, 37)

The early market entrants have now the significant domain expertise in carbon and sustainability management, those are IHS, Enviance, Carbonetworks. The growing pressure from external sources has drawn the interest of large enterprise solution providers, major systems integrators, like SAP, CA with its "ecoSoftware". The other category is the "newcomers", like Hara Software, BlueSky Carbon, ClearCarbon and C3. The market for IT services in carbon and sustainability management is growing as the market conditions are in the process of being reviewed and set. (Ovum 2010, 24.)

Ovum research names Oracle, Microsoft and SAP as the upfront positioned ICT companies in moving into sustainability (Ovum 2010, 29). The system integrators providers, like Fujitsu, IBM, Tieto, Accenture, CSC, Logica and Capgemini are quite representative in focusing on sustainability services (Ovum 2010, 30)

The Verdantix research after reviewing the carbon management software applications have organized them in a quadrant matrix, determining leaders, challengers, entrepreneurs and specialists. The two matrix dimensions are vendor's capabilities and the momentum, which assesses the customer references, partnerships, marketing strategy and company resources. On the matrix below the high scored are IHS, Enablon and Enviance, the early entrants and the HARA software "newcomer" on the market. The large systems integrators are presented with average scores.

Figure 14: Green Verdantix Quadrant Carbon Management Software Vendors Globally (Verdantix 2009, 18)

The increasing number of vendors and offerings reflects their conviction that the market is going to grow significantly. With the market for these ICT solutions growing and with understanding the significant impact that ICT sector can make not only to save costs for companies, but also for environment, the cooperation between ICT companies towards climate protection is strengthening.

2.4.4 GeSI Global e-Sustainability Initiative

For the ICT sector cooperation, the international strategic partnership of ICT companies and industry associations to promote technologies that foster economic, environmental, and social sustainability was organized in 2001. Current members of GeSI are such large international ICT companies, like AT&T, BT, Cisco, Deutsche Telekom, Ericsson, European Telecommunication Network Operators Association, GSM Association, HP, Motorola, Microsoft, Nokia, Nokia Siemens Networks, Orange/France Telecom, Verizon and Vodafone. Associate members are the Carbon Disclosure Project and World Wildlife Fund. According to the GeSI assessment, ICT sector can contribute to climate protection in three main ways:

- increase network energy efficiency, including telecommunication network, data center efficiency, renewable energy powered telecommunication services.
- increase buildings energy efficiency
- ICT products and services that reduce climate change impact. (GeSI 2008, 15.)

The ways defined by GeSI are quite similar to those in SMART 2020 Study, the classification only is different. Consequently, after the market research companies, and ICT companies itself have recognized the possibility of their contribution to the climate protection, and the potential for a new business opportunities, new offerings are starting to appear on the market.

Other sectors are also trying to find the business opportunity in climate protection. The environmental technology is considered by Roland Berger Strategy Consultants as the key industry in 21 century. The turnover of the global environmental industry will double by the year 2020 and make EUR 3 100 billion. Germany is on the third place in global ranking of the green technologies. (Roland Berger 2010, 2)

2.5 Global Environmental Factors

The environment itself is urging for actions, as Germany is the sixth largest emitter of CO_2 emissions, after the United States, China, Russia, Japan, and India. In the next graph you can see how fast will be the carbon emissions from the energy production and consumption growing worldwide.

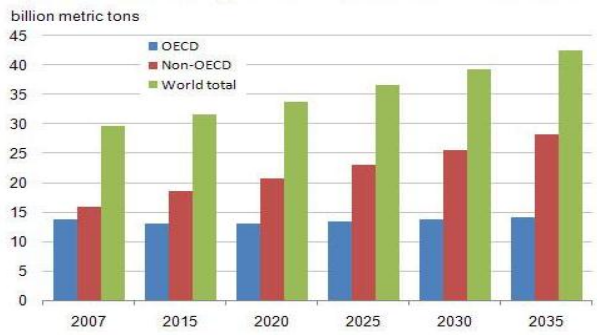


Figure 15: World Energy Related Carbon Dioxide Emissions (International Energy Outlook 2010)

In 2007 Germany's CO_2 emissions amounted to approx. 956 Mt, which is around 2, 3% of the global emissions. On the graph you can note that the energy sector is responsible for the majority of emissions, approx. 80 % of total figure (SMART 2020 Deutschland Addendum 2009, 10).

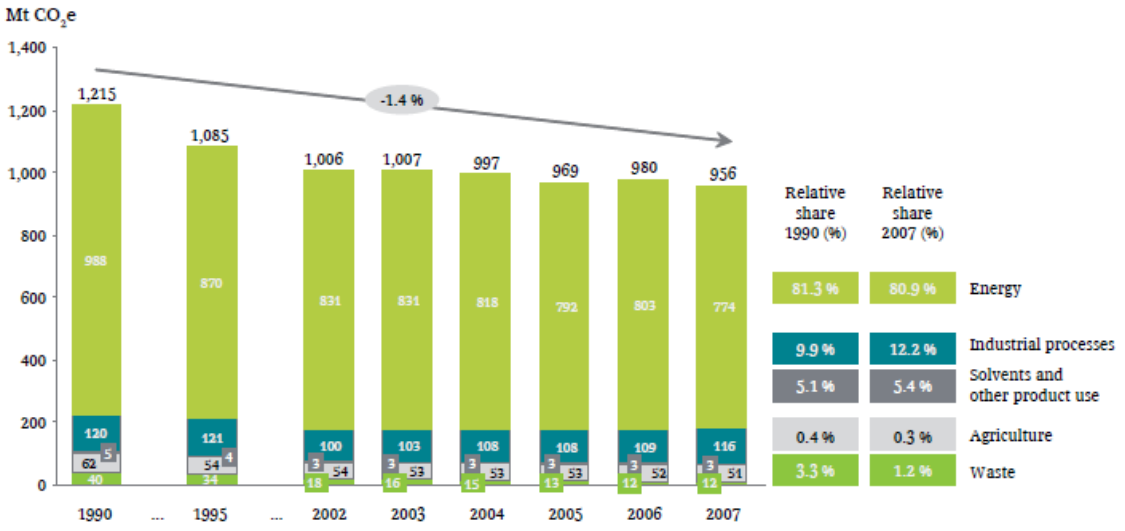


Figure 16: Development of CO_2 emissions in Germany from 1990 to 2007 from the source perspective (SMART 2020 Deutschland Addendum 2009, 10)

In Germany the largest emitter of GHG is building industry with 330 Mt CO_2 in 2007. With a total of 276 Mt CO_2 in 2007 the manufacturing industry is the second largest polluter (SMART 2020 Deutschland Addendum 2009, 12).

2.6 Legal Factors

Legal factors include tax policy, the violating regulatory rules, which could impose future penalties and charges for companies. These factors can affect how a company operates, its costs, and the demand for its products.

2.6.1 Global Legal Factors

2.6.1.1 The EU Directive on Energy Efficiency and Services

The EU-Directive of the European Parliament and of the Council of 5 April 2006 on energy end-use efficiency and energy services sets an indicative energy saving target of 9% by 2016 for all the member countries. However, the directive is not the binding legal law; it is just the suggested policy for the member states. (Europe 2008 a.) To make sure the states know how to control and reduce energy demand, the Action Plan for Energy Efficiency for the period 2007-2012 was introduced. The purpose of this Action Plan is to develop the internal energy market with the most energy-efficient infrastructure (including buildings), products (including appliances and cars), and energy systems in the world. The estimated target is to save 20% of annual primary energy consumption by 2020. Such an Action Plan is suggested to be developed for each member state. (Europe 2008 b.)

2.6.2 Legal Factors Germany

2.6.2.1 National Energy Efficiency Action Plan (NEEAP)

Adopted in 2007 the NEAAP was prepared under the European Energy end-use and Energy services directive, which requires achieving energy savings of 1% per year over 9 years,

starting from 2008 until 2017 (NEEAP 2007, 6). The Action Plan summarizes the planned measures to achieve the target. The main focuses are the following:

- Liberalization of electricity metering, which will ensure the competition in the smart metering services.

The EU energy sector liberalization, started in 2004, brings households and industrial customers a possibility to ensure electricity supply according to their individual needs at easily and clearly comparable, transparent prices. It makes the free choice of their electricity supplier possible and creates effective competitive environment among electricity producers, importers and suppliers (EurActiv 2009).

- Increased investment in the energy efficiency of public buildings (NEEAP 2007, 4).

The energy requirements in German building code are set on the national level (Frost & Sullivan 2010). Germany can be named a leader in the building sector with regard to the energy efficiency policies (IEA 2009 b, 50).

- Funding programmes to stimulate the potential efficiencies in the industrial, household, agriculture and forestry, trade, service and transport sectors.
- Emphasizing the importance of modern energy management systems in the industry. (NEEAP 2007, 4.)

2.6.2.2 The ECO-TAX

To substitute the ecological and environmental damage by the companies and to create incentives for them to change the behavior towards more ecologically efficient use of resources the eco-taxes are being introduced in some EU countries (Europäische Umweltagentur 2010). Currently, in Germany strongly affected by the new eco-taxes are companies in steel, metal, chemical, glass, paper and construction materials industries. According to a draft law from the German finance ministry, from 2011 companies will only be able to reduce their eco-tax burden by up to 85%. From 2012, businesses will only be entitled to environmental tax relief of up to 65%. Currently, businesses in Germany are able to reduce their eco-tax burden by as much as 95%. (Handelsblatt Aug. 2010, 13.) That is only the electricity eco-taxes, but there is the emission trading scheme, described in economic factors, which as well creates the burden for some companies. The regulatory situation is rapidly changing, so there is a possibility that other section not only energy intensive would be obliged for eco-taxes and emissions trading certificates. In the pilot Energy Concept from German Ministry of Economy and Technology dated September 2010 is stated that the Federal Government

will still facilitate the taxes payments from the year 2013, only if the company contributes to energy savings. The proof of the savings can be consolidated through the reports from the energy management system of the company. (Bundesministerium für Wirtschaft und Technologie 2010, 12.)

3 COMMISSIONING PARTY – T-SYSTEMS INTERNATIONAL GMBH

3.1 Deutsche Telekom AG

Deutsche Telekom AG (DTAG) is one of the world's leading and the Europe's largest telecommunications and information technology service companies with headquarters in Bonn, Germany. Deutsche Telekom is a public company with 260,000 employees in approximately 50 countries and the total revenue of EUR 64.6 billion (12/2009). René Obermann is the Chairman of the Board of Management, CEO of the Group Deutsche Telekom AG, the company with the leading position on the German market (Deutsche Telekom 2010).

Deutsche Telekom was formed in 1996 after the privatization of the stated-owned company Bundespost, which foundation goes back to 1877. However, the German government still holds shares in the company's stock. (Celtnet 2010.)

3.2 T-Systems International GmbH

T-Systems, founded in the year 2001, is the Deutsche Telekom corporate customers arm, which offers network-centric ICT solution i.e. combined IT and telecommunications services with headquarters in Frankfurt, Germany (T-Systems 2010 a). With global presence in over 20 countries, with approx. 46,000 employees worldwide, T-Systems has generated revenue of EUR 8.8 billion in 2009. T-Systems provides information and telecommunication services (ICT) for multinational corporations and public institutions worlwide and has the leading market position in Germany. It serves companies in all industries, and is number one ICT provider in the automotive sector in Western Europe. (T-Systems 2010 b.) The companies key solutions include: voice and data network solutions, information technology solutions and real information and telecommunication technologies (Datamonitor 2009, 3). Reinhard Clemens is CEO of T-Systems and Member of Deutsche Telekom Board of Management (T-Systems 2010 a).

T-Systems' strategic partners include Alcatel-Lucent, Cisco Systems, Dell, EMC, Fujitsu Siemens Computers, Intel, Microsoft and SAP. The major competitors are IBM Global Ser-

vices, Computer Sciences Corporation (CSC), HP Enterprise Services. (Datamonitor 2009, 6.)

3.3 Company's Strategy

In 2010 to follow the 'Fix- Transform- Innovate' strategy of Deutsche Telekom, T-Systems has restructured its portfolio according to the new five 'Core Beliefs' of T-Systems i.e. the new leading topics, where ICT plays a central role in resolving the customer challenges on the basis of resolving megatrends. The Core Beliefs of T-Systems are: Dynamic Net Centric Sourcing, offering SAP and cloud computing solutions, Collaboration, with Managed Workplace Services and dematerialization solutions like Virtual Conferencing, Mobile Enterprise, Security and Governance, and Sustainability and Corporate Responsibility, with Green IT offerings (T-Systems 2010 c). The latter refers to ICT provider as a driving force on the road to sustainable climate protection.

Up to 25% of CO_2 emissions or equivalent pollutants can be saved in 2020 by using information and communication technology (ICT) in Germany (Smart 2020 Germany 2009). Consequently Deutsche Telekom and T-Systems face the responsibility for the environment. The ICT service provider discovers, develops, uses and sells solutions that save electricity, reduce paper consumption, minimize the use of hardware and reduce the traffic load, thereby save costs and reduce CO_2 emissions. In the Corporate Responsibility Strategy of Deutsche Telekom three main focuses are Connected Life and Work, Connected the unconnected and Low Carbon Society. T-Systems can support these fields, particularly with Green ICT solutions in Low Carbon Society Strategy.

3.4 T-Systems Offering - 'Smart Energy 4 Enterprises'

Anticipating the fact that carbon emissions became a new metric of corporate performance and for cross selling of its Green ICT solutions, T-Systems introduces the new offering 'Smart Energy 4 Enterprises', which refers to energy consulting and implementation of an Enterprise Energy & Environmental Management System (EEEM), also called Enterprise Carbon and Energy Management (ECEM). The goal of an EEEM System is to consolidate data concerning energy-/resource consumption, to provide dashboards and reports and to

manage and monitor activities which are setup to reduce energy-/resource consumption. 'Smart Energy 4 Enterprises' is planned to be an enabling offering to sell further Green ICT solutions offered by T-Systems.

For this offering T-Systems has chosen Hara Software, one of the leading provider of environmental and energy management solutions. Hara Software is a privately held software firm founded in 2007 with 30 employees and headquarters in Redwood City, California (Bloomberg 2010). Hara EEEM solution is available on a Software-as-a-Service basis and the biggest reference customers are Coca-Cola Company (Verdantix 2009, 30) and the City of Palo Alto in California (Forrester Research 2009, 3). Verdantix Research analyzed twenty-two carbon management software vendors in Green Quadrant Carbon Management Software Matrix. Hara is presented in the Leaders position with the strongly developed capabilities in enterprise data capture, master data management, emissions factor tables and reporting (Vedantix 2009, 30).

EEEM Systems consists of three layers:

1) Sense and Monitor. The system collects data from different company's assets, like data centers, IT equipment, buildings, vehicles, manufacturing facilities and employees. The data includes energy, electricity, natural gas, petrol/gasoline, water consumption, amounts of solid waste produced, employees travel information. The sources of the obtained information can vary depending on the company, that can be automated sources, like smart meters, electric meters, SAP applications, fleet management applications, data center equipment and manual sources, like utility bills, excel spreadsheets, done by the company by manually entering the data.

2) Aggregate, Analyze and manage. The data received is analyzed in dashboard format. The software could be as well connected to the company's facility management systems or automation systems and the user can through the tool turn off the lights in unoccupied areas or turn down the temperature in the data centers, for instance.

3) Govern and Report. The system is connected to the financial reporting and corporate social responsibility management of the company, so that it can report the data in the standard formats like the Carbon Disclosure Projects. (Forrester Research, 2009.)

Hara's EEEM Software is based on the same principle, however it adds the fourth layer called 'Innovate' which leverage best practice from the activities that it itself implements in order to increase efficiency, reduce costs and decrease CO_2 emissions.

The connection of EEEM software to other company's systems is illustrated in the next graph. It is also possible to directly report the systems' figures in the CDP reporting standard.

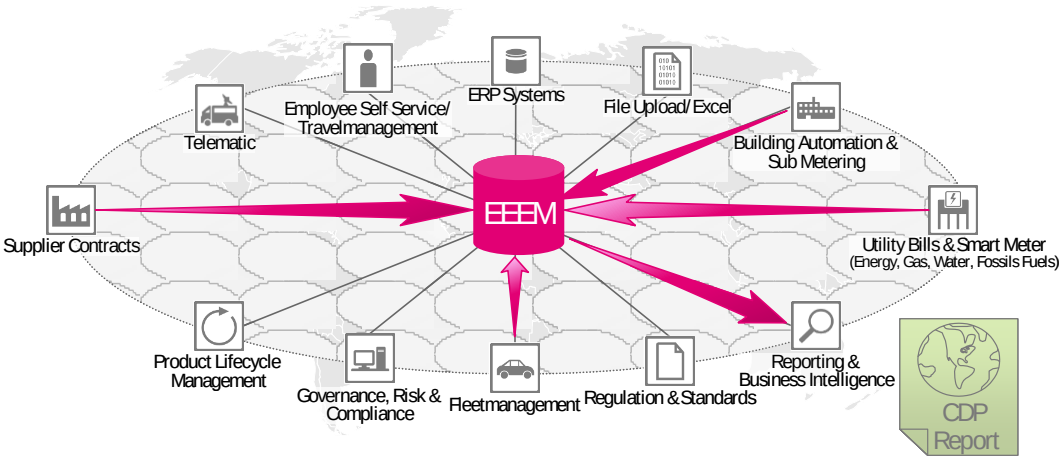


Figure 17: EEEM Overview (T-Systems internal)

4 MARKETING RESEARCH

4.1 Methodology

Is there really a trend of being energy efficient for companies? Do firms then consider the services from ICT sector to become more energy efficient and reduce their CO_2 emissions? Is sustainability really strategically important for businesses and if yes, what is the possible role of ICT? The available literature on those topics describes the possible chances of the ICT industry very restricted, so the market is not well analyzed yet, there is neither statistical nor literary information enough at the disposal. The studies from McKinsey and Forrester analysts were the sources of the initial exploratory research on the possible business opportunities for the ICT sector in the energy efficiency market. Obviously, there is a demand for the deeper marketing environment research and analysis of the ICT sector's opportunities in climate protection, or if more precisely the energy efficiency behavior pattern of the companies.

To determine the business opportunities all the influencing factors should be defined and analyzed. Qualitative research enables to probe deeper in exploring ideas and clues with small samples of experts and customers to allow a high degree of flexibility, to obtain a valuable unpublished primary data and secondary data publications not readily available outside the membership of professional and trade bodies to be able to use the results of the research in order to obtain a competitive advantage (Wright & Crimp 2000, 25).
There are usually independent and dependent variables of every issue. In energy efficiency market the independent variables, the causes, are the environment of the firm and the market environment. The external forces beyond the control of a company are described in PESTEL analysis in the secondary research. The sources of the secondary data are both external and internal, namely governmental statistics, industry reports and T-Systems International GmbH internal reports and analyses. To estimate the potential effects of these external forces and interpret their impact on the environment are some of the research objectives. That could help the firm to be more proactive that is, to anticipate customers' requirements and to focus on marketing efforts more effectively in the marketing place, as opposed to being reactive to market developments. The effects from the influence of the external forces on the company's target markets are the dependent variables, as well as the ef-

fects of the ICT provider decision making strategy. Those effects are the consumer's responses, awareness, interest, demand, motivators to buy, the behavior, and attitudes of customers to specific brands. To recognize those is the next research objective.
The appropriate research design is both descriptive and exploratory, when historic and current data in consumer and organizational markets and their marketing environments is usually analyzed. The purposive (non-random) sampling also referred to as judgmental or non - probability sampling, is applied. Judgmental sampling is often used in selection opinion leaders or "captains of industry"- chief executives of firms who are significant in directing and influencing the course of events in their companies (Wright & Crimp 2000, 39). The collection method of the primary data is questioning, exploring the market through the depth expert interviews and the online questionnaire. Two interviews conducted were non-directive interviews, where the respondents were free to come up with experience, attitude or idea, semi-structured, as there was an agenda designed to ensure that specific aspects of interest are covered.

The second part of the research consists of the online questionnaire addressed exclusively to CIOs of the SMEs and large companies in Germany, as well the customers of T-Systems through the Web 2.0 communication tool. The questionnaire was based on the German online social business network platform XING (www.xing.com). On the XING social network the CIOs belong to the special group called "CIO eXchange" group (https://www.xing.com/net/pric1b4f0x/cio_open/), through which was the direct contact with the CIOs established. So the members of this group are the survey population, and the sample resulted in 20 respondents, which means the response rate of approx. 20%. The questionnaire was structured with closed direct questions, but with the possibility to share own ideas and thoughts.

5 RESULTS

The following chapter presents the results of the conducted marketing research. The interviews' and the questionnaire's results are compatible and quite similar.

5.1 Depth Interviews

Two expert interviews provide the comprehensive overlook at the companies' attitude towards sustainable development, in particular, energy efficiency activities, and the role of the ICT sector.

5.1.1 First Expert Interview – Chief Sustainability Officer at Deutsche Telekom AG

The first expert interview was addressed to Dr. Ignacio Campino, Representative of the Board of Management for Sustainability and Climate Change at Deutsche Telekom AG. Dr. agr. habil. Ignacio Campino has been working for Deutsche Telekom since 1995 first as the Head of the Central Environmental Affairs Office. He represents Deutsche Telekom in different initiatives for mitigating the consequences of global warming and promoting measures for climate protection at global European and German level. He is an experienced specialist in sustainable development, who has brought Deutsche Telekom company at a leading position in matters of sustainability. He is a member of the Information Society Technologies Advisory Group of the European Union and is heading the Working Group Sustainability. He is also a member of the WWF Deutschland Board of Trustees and of the UNESCO Commission's German National Committee for the World Decade "Education for Sustainable Development.", also he is a member of the Board of Trustees for the Potsdam Institute for Climate Impact Research (PIK). He also gives lectures on business ethics at the Johann Wolfgang Goethe University in Frankfurt. (International Telecommunication Union 2009.)

According to Dr. Campino, the very first step for the company to pursuing sustainability strategy is to define sustainability itself. Stakeholders' interpretation of the term sustainability often differs and causes misunderstanding. The term "sustainability" for Deutsche Telekom

means "the combination of social, economic and environmental issues", though in Germany the focus is mostly on the environmental issues. Human resources department plays also the crucial role in the sustainability strategy of the company, for instance the women quota. Consequently the organization of the company acts like the mechanism defining those responsible for sustainability. At Deutsche Telekom the corporate responsibility topic has the strategic importance and is under the Board of Management control. Typically, the sustainability topic is under the corporate responsibility roof. In such a large international company, approximately 100 people are working only on the corporate responsibility and sustainability topic, the part of which is also research work. The corporate responsibility topic is mainly associated with the company's executive level, the task only for the central main unit or one department at headquarters, not the local units' business. Those percept sustainability as the extra activity of the central unit, which is considered to be usually in a financially better position. Consequently the sustainability topic has to conquer itself a positive image at the local business units of the company.

ICT sector can contribute to the CO_2 emissions' reduction, making sustainability the part of the business of Deutsche Telekom and providing new opportunities for the company. Should be mentioned, that ICT sector is not the subject of regulatory pressure on the CO_2 emission and energy consumption yet. "Many companies fear climate protections, but they should fear climate change, generating business opportunity from climate protection" (Dr. Campino).The communication of the company's strategy plays an important role in the dialogue with the customer to get the understanding how crucial the sustainability topics are.

Deutsche Telekom carbon reduction strategy is mainly based on the shifting from PSTN (Public Switched Telephone Network) to VoIP (for Voice over Internet Protocol) internally. At the same time, the performance of the data centers is anticipated to increase, so will the CO_2 emission of the data centers, where new energy efficiency policy is planned. Emissions reduction occurs from new technology implementation and energy efficiency. In other words technical development of the internal network contributes greatly to the emissions reduction. With the new estimations after approval of the long term carbon reduction strategy, Deutsche Telekom is convinced to achieve a point of CO_2 digression to the year 2014. Only electricity appears to be in focus for the reduction targets, not water or gas.

The sustainability exertions are well communicated to the public, which is not always highly engaged. The carbon reduction strategy and all the energy efficiency efforts of the Deutsche Telekom are reported to the Carbon Disclosure Project. Corporate Responsibility reports

are also issued and available at the exhibitions and fairs. According to Dr. Campino, communication strategy of advertising through reports, brochures is not highly effective to engross common public with the climate change topic, only loyal customers or investors. Low awareness of people on sustainability and what is sustainable, as well as climate change and climate protection is a contemporary challenge worldwide.

The collective systems for data consolidation on energy consumption from Credit 360 provider is established on the internet for the employees to tape in the information there, which is the modernized version of the commonly used excel sheets. The central requirements for the ECEM Software are to be easy to handle and have low costs, meaning not to require the additional employee training. The efficiency of the software, the accuracy of data collection and its presentation and analysis are essential. Smart meters do also collect the consumption data, providing more clear and exact view on the company's energy figures.

Dr. Campino estimates, that although, Germany is implementing sufficient number of measures against climate change, the developing countries, like Mexico show a greater potential for the ECEM types of software, based on the greater concern about the energy figures.

Daimler AG, BMW are among the companies known for the sustainability strategies and measures, however the SME are more active and faster on the battle for climate protection inside the company.

5.1.2 Second Expert Interview - Head of Steinbeis Consulting Center of Renewable Energy and Energy Efficiency

The second interview was conducted with Sebastian Dürr, the Head of Project Development Steinbeis Consulting Center of Renewable Energy and Energy Efficiency. The Center provides consulting and support in project development, technology management and marketing for commercial customers from industry and public sector. The examples of the Steinbeis Center's projects are development of a regional energy agency, coaching for municipal clients in the energy sector, support and implementation of applications in various national and European funding and stimulus programmes (SBZ 2010.)

Referring to Sebastian Dürr, the high level of awareness is among the companies in the sectors, which are directly influenced by the energy prices or GHG emissions regulations. For industry customers, like electricity providers, energy efficiency has a considerable importance. The competitive energy market demands efficiency from the energy provider, in order to be able to compete in prices and service. Therefore, there is a demand for efficient technologies. Another example is middle sized brewery, which customers are very price sensitive, and so the efficiency can help to save costs and indirectly lower the products prices. "Even though if the climate change topic is tightly attached to the minds of the management board of the company, the main interest, especially in the times of the post crisis recession times, is the quartile financial figures" - Sebastian Dürr. However, the number of companies, interested in improving their brand image through marketing the usage of environmentally friendly products or alternative energy sources is certainly increasing.

The energy consumption in companies differs from sectors. For Steinbeis consulting company traveling of the employees accounts for the largest emissions production. Here is as well the largest potential for reducing the costs and emissions.

The methods how to increase energy efficiency are depending on the company, its size and location. "Large enterprises can't exist without excel tool" - Sebastian Dürr. Most of the companies' energy consumption data is typed manually in excel sheets. The portion of the companies, which have their own smart metering system or other energy metering systems, is modest.

5.2 Online Questionnaire for CIOs

The questionnaire's results show that the internal organization of the companies doesn't support the sustainable development, corporate responsibility or control under the usage of the energy resources. That could be seen in the graph below, which illustrates the questionnaire's results for the first question. The positive answers are marked with the green color; negative – with yellow.

Does your company have a department, responsible for the following topics?	Yes	No	N.A
Corporate Responsibility/Sustainability (avg: 1,75)	25%	75%	
Health, Safety (avg: 1,65)	35%		
Energy/ -resources Efficiency (avg: 1,70)	10%	75%	
Total	27 %	72 %	2 %

Figure 18: The extract 1 from the questionnaire's analysis

The sustainability topic in the questioned companies is mostly the responsibility of the managing director, CEO or facility management. However, from the relatively significant amount of answers could be concluded, that the companies don't have anyone, who is responsible solely for the sustainability issues and sustainable development.

Most of the questioned CIOs work at logistics and manufacturing industry, where they share the same goal, namely, to save costs through energy efficient activities. The other reasons for implementing energy efficient activities were neglected, with exception of the rarely chosen answers, like mitigating the climate change, sustaining competitive advantage and energy efficiency being a "trendsetter".

Concerning the operational benefits of implementing energy efficiency, the greatest energy is seen to be consumed at the production area and fleet, while the lowest during the employee travel. Meanwhile, the greatest energy saving potential has been granted to the production sites and fleet, as well.

The next part of the questionnaire was devoted to the company's present "green" activities, where half of the replied CIOs confirm the activities towards more transparent resources consumption in the company. Electricity and gasoline are of the biggest concern. Even though, the answers are from the CIO of medium and large enterprises, the introduction of the energy from renewable sources is not planned.

The communication of the companies' sustainability initiatives is inconsequential. There is no tendency to commit to CO_2 reduction or implement energy efficient measures, according to the results. However, the successful sustainability achievements of the companies' are partially reported or planned to be published, as it is shown in the table below.

Is the success of the implemented energy efficient measures reported? (ex. CDP)		
Yes	N=6	30%
Planned in the next 12 months	N=3	15%
No	N=10	50%
N.A.	N=1	5%

Figure 19: The extract 2 from the questionnaire's analysis

After all, the energy efficiency activities enforced are not planned to be certified, probably because of the absence of knowledge on the available certifications.

Possession of the information concerning the companies' own energy consumption or CO_2 emissions is non-comprehensive. The most used sources of such information are bills form utilities or energy providers and the analysis of the fleet management (the company's vehicles). The majority of the companies have more than 1000 employees and no travel portal for them available. Usually the travel portal is in a company's internet, where employees can easily book train or plain tickets for their business trips and directly communicate the costs to the cost center. The CO_2 emission and the energy consumed by the used vehicles could be also shown. More detailed view on the results is in the next table.

Sources of information used:	5/ intensively used	4	3	2	1/ not used	N.A
Bills from energy provider (avg: 3,59)	32% (5)	26% (4)	(3)	(2)	16% (1)	
Access to Smart Metering Systems (avg: 1,75)			21%		47% - not used	
Own load management system "Lastgangmanagement" (avg: 1,85)				42 %	32%	
Part of the production planning process (avg: 1,62)				47%	32 % N.A	
Analysis from the fleet management (avg: 2,31)	17%		22% (2)		39%	
Analysis form the travel portal (avg: 1,88)			16%		53%	16%
Analysis form the ERP systems (avg: 2,13)			21%	16%	37%	16%
Total	8 %	11 %	10 %	12 %	40 %	19 %

Figure 20: The extract 3 from the questionnaire's analysis

The only used tool for developing sustainable is Excel. The companies don't use any carbon management software or any online databank to at least monitor or control the emissions and the energy consumption, as the table below from the questionnaire's analysis shows. Consequently, that information is only communicated internally and no external audits or services providers are allowed to involve.

Tools used to get the information:	5 / intensively used	4	3	2	1/not used	k.A.
Excel (avg: 3,31)	**33% (5)**	**28% (3)**			**17%**	**11%**
Carbon Management Software (avg: 1,08)				**75% - not used**		**19%**
Other Software (avg: 1,64)				**59%**		**18%**
Online-Databank (avg: 1,31)		**13%**		**63%**		**19%**
Total	10 %	1 %	9 %	12 %	51 %	16 %

Figure 21: The extract 4 from the questionnaire's analysis

Positively, CIOs see the solution of their problem in new technology, like some metering systems or ERP software, which automatically transmits the data. Nevertheless, the introduction of the enterprise carbon and energy management (ECEM) software is not planned and would be like, if possible, to be outsourced to independent energy consulting. The graph below presents the result of the question.

Which plans do you have on introduction of Enterprise Carbon & Energy Management Software?		
Introduction is planned in the next 12 months	0	**0,00%**
Possible introduction in the next years	2	**11%**
No planning at all	12	**63%**
N.A	5	**26%**
The software already introduced	0	**0,00%**

Figure 22: The extract 5 from the questionnaire's analysis

Furthermore, the IT budget of the companies to spend on the solutions that increase efficiency and reduce CO_2 emissions considered to be more than 5 %. Anyway, IT budget in comparison to other solutions is small, as the next graph shows.

How high do you estimate the IT budget in your company for energy efficiency measures and CO_2 reduction? (in comparison to other solutions)		
More than 50%	2	11%
Between 25 and 50%	2	11%
More than 5%	7	37%
Less than 5%	6	32%
Don't know	2	11%

Figure 23: The extract 6 from the questionnaire's analysis

The awareness of the CIOs of the existing offerings of ECEM software from leading IT and ICT companies is deficient. SAP and Siemens are the only providers to be associated with such offerings. Nevertheless, T-Systems is also remarked by two CIOs.

6 DISCUSSION

According to the secondary research and the results of the primary research, there is definitely the market for energy efficient and CO_2 reducing solutions. The market is in its early stage, nonetheless rapidly developing. Especially for ICT companies, the energy efficiency area is not quite discovered yet. Therefore the businesses' awareness on the ICT sector's possible assistance is rather low. The companies still tend to consider their energy provider as the potential guidance for consuming energy in a more efficient way, not the external IT firm. However, that depends on the sector as well. The heavy industry already suffers from the governmental pressure in Germany that automatically creates the awareness on the possible methods and solutions for reducing CO_2 emissions of the companies in the sector. The other sectors, on the contrary, seem to be not yet future oriented and not worried about the following regulations on CO_2 targets for all industries in Germany. Of course, that could be associated with the still post-recession times, when the board of management is more interested in financial figures, than mitigating the climate change. Anyhow, the social and political influence would be soon too high, to be unconcerned about the emissions and the usage of resources. The public awareness on the topic grows proportionally with the market for the "green" technologies. The public awareness increases also with the emergence of non-governmental cooperation, like Carbon Disclosure Projects or GeSI. The introduction of the new executive position, namely, CSO, the CDP's leadership and performance indexes, draw shareholders attention to the sustainability initiatives of the company. Energy has become not only the cost factor, but the strategically important subject for the companies. Furthermore, the efficient energy usage can nowadays be a positive branding message for the company's image that improves brand equity. The successful marketing of the company's sustainable development could form the competitive advantage. The external environment globally and, specifically in Germany, is being prepared by the governmental regulations, new policies and directives for the rapid growth of the new energy efficiency market.

The unexpected finding is that, businesses do not still associate themselves with the public cluster, which has a huge impact on some social or environmental issues. Some large enterprises have already begun to implement social and corporate responsibility initiatives, but not medium sized companies. The businesses perceive other companies as competitors only. For the climate change issues the union of the public is important. The Kyoto Protocol has shown the countries union, the companies union is needed. Corporate Responsibility can

unify the companies; however it is not always defined in the common way. If the firm itself tries to be more efficient in using the natural resources or pollutes less dangerous gases, then it also takes responsibility. Unfortunately, for business the financial side is always important, and here the ICT companies could help. The ICT solutions could save, additionally, significant costs for the firms; that would be the most effective selling proposition currently. The proof of the value of sustainability software adds up to more than the economic benefits – it is how ROI (return on investment) meets the TBL (triple bottom line), when environmental and social performance of the company is taken into account in addition to the financial performance. The triple bottoms lines are People, Planet, and Profit. The returns on sustainability investments depend on the reasons of the company for introducing the EEEM software. Basically, there are three main reasons:

- Initiative tracking. A company wants to implement energy efficiency measures through achieving the transparency of the resources. In this case, the success of the software implementation depends on how energy efficient the company is already, how big is the scope for improvement.

- Progress against goals. A company wants to have a system to streamline the process of implementation and performance measurement of efficiency measures, instead of using spreadsheets, which demand high manual effort.

- Reporting emissions. A company wants to optimize and automate the process of reporting, for example sustainability reports, CDP-reporting.

Therefore, "Smart Energy 4 Enterprises" offering can cover all three bottom lines. However, there is no standardized measure of ROI, as this depends on the company's individual conditions. For example, the City of Palo Alto, which was mentioned before as the client of Hara Software, is expected ROI to be less than three months. The goal of the City was to reduce GHG emissions by 5% at minimal costs through achieving transparency. Over the next three years the City expects to save annually $600,000-700,000, only due to the reduced electricity, water and natural gas use. (Hara 2010.)

There are business opportunities for Enterprise Carbon and Energy Management Software, as it provides transparency and valuable systematic information on resources consumption and can be connected with the CO_2 targets of the company, showing the required reductions. For that reason, there are significant market opportunities for T-Systems' offering

"Smart Energy 4 Enterprises". Nowadays, the CIOs still have a lack of information and don't exactly know their company's consumption and pollution that it causes. They are not well informed about the external political conditions or possible legal changes.

Despite of the early stage of the market development, there are already a number of IT and ICT companies, introducing the new "green" offerings. That makes entering the market more complicated, but not vain. T-Systems, a large enterprise associated with the innovative offerings, is believed to have the complete "green" portfolio. For the executives the ECEM software would be fundamental to get informed about their company's environmental parameters.

Though, the research shows the unawareness of businesses', the validity of the results could be controversial. The research has qualitatively measured the market and the current interest of the firms in the energy efficiency area. It has examined the connection between ICT/ IT sector and sustainability. One of the objectives of the marketing research was to try to find and identify the trends in energy efficiency area. The qualitative research is restricted to the proof of hypotheses, and can't quantify the market's opportunities. However, the detailed qualitative research has created the comprehensive picture of the energy efficiency market for ICT companies, by collecting and analyzing the information from possible customers of the ECEM offering, competitors, regulatory bodies, and other players.

7 CONCLUSION

After analyzing the marketing research, could be concluded that the objectives of the work were accomplished. The goals were to research the energy efficiency area for ICT sector and determine how the external forces affect the environment, which of them are the strongest market drivers. Furthermore - to state if there are business opportunities for ICT companies in energy efficiency area, and if the market is not too immature for the new offering from T-Systems provider. In addition to that, the objective was to analyze the companies' readiness to engage themselves in sustainability initiatives.

The environment of the energy efficiency market consists of the political, economic, social, technological, environmental and legal factors that together create both risks and opportunities for the businesses. ICT sector, IT integrators, consultants have big opportunities in enterprise software market, where is the demand for professional services rapidly growing.

The Forrester Research expects ECEM software to be implemented by the majority of companies over the next five years. The market for the software has already started to be developing, so have the offerings from ICT/ IT providers. CIOs recognize the role of ICT sector in improving efficiency of the company's operations and saving costs. Consequently, it is exactly the right time to introduce the new offering on the market. However, the marketing strategy should be aligned with the recommendations, given in the next chapter.

"Smart Energy 4 Enterprises" offering can be seen as the enabler of energy management certification. However, the companies, possible customers, don't possess the required knowledge yet to prioritize the scarcity of energy resources and the danger of climate change under the financial objectives. Despite the number of advantages of the EEEM systems' adoption, companies focus commonly on only one desire to reduce costs through improving operational efficiency. Furthermore, firms in different industries have different levels of visibility and urgency about enterprise carbon and energy management systems.

8 RECOMMENDATIONS

The gap between the theoretical reduction of CO_2 emissions and market-driven implementation has to be closed. The new business concepts that can reduce CO_2 emissions significantly and are at the same time commercially attractive are to be developed. The policy that creates the right conditions to enable the widespread consumer access to new low-emissions business concepts should be developed as well. The policy will help to overcome the political, economic, social, technological, and legal barriers on the way to implementation of the new concepts. The public awareness of the current climate conditions, possible methods and tools for reduction of CO_2 emissions and energy consumption, increase of resources efficiency, ought to be increased through the joint campaigns from government and enterprises. The population and the businesses should be aware of the contribution that they can make towards climate protection and motivated to perform it as well. The motivation could be developed through the introduction of some policies, like fees or taxes. The legal requirements for environmentally conscious behavior would be an encouragement for people and companies. The technical standards for such software systems that reduce CO_2 emissions and increase energy efficiency are important, and have to be unified for the ICT companies.

8.1 For T-Systems Offering "Smart Energy 4 Enterprises"

The vendor should understand the degree of complexity of the external conditions and uncertainty the customers may face. Therefore, the solution needs to address fast changing regulatory and market conditions, and also the regulations or binding emissions targets that the customers, the particular industry, for example is likely to face in the future. The rapidly changing carbon-related reporting guidelines and standards should also be up to date in the ECEM tool.

The marketing focus of the product should be done on the cost saving possibilities and increasing efficiency and consequently reducing energy bills. As the marketing research shows, the possibility of mitigating the climate change or reducing pollution is not enough strong motivation for customers to buy the offering.

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